Actionable Patient Safety Solutions (APSS) #2E:

Clostridioides difficile infection (CDI)

How to use this guide
This guide gives actions and resources for creating and sustaining safe practices for *Clostridioides difficile* infection (CDI). In it, you'll find:

Patient Safety
M O V E M E N T

Executive summary checklist

Clostridioides difficile(also known as C. *diff*) is an opportunistic bacterium that can cause symptoms ranging from diarrhea to colitis or life-threatening inflammation of the colon (CDC, 2012). C. diff is a spore-forming, Gram-positive anaerobic bacillus bacteria that produces two exotoxins: toxin A and toxin B (CDC, 2012).

Transmission of C. diff is primarily via the fecal-oral route. Patients can become infected with *Clostridioides difficile* infection (CDI) if they touch items or surfaces that are contaminated with feces and then touch their mouths or other mucous membranes. This issue is especially important in healthcare settings because staff can spread the bacteria to patients or contaminate surfaces using their hands.

Use this checklist to help you prioritize your actions and measure your organization's progress in each area. Prevention of CDIs requires the following actions:

Create an action plan

- ☐ Implement an antimicrobial stewardship program to prevent and/or minimize CDI rates in healthcare settings
    - ☐ Go to APSS #3B to learn more
- ☐ Maintain contact precautions for at minimum 48 hours post resolution of diarrhea, up to the duration of the admission
- ☐ Use a laboratory-based alert system for immediate notification of all C. diff positive test results
- ☐ Implement technologies that support proper surface cleaning and utilize as part of a defined environmental control best practice program, such as:
    - ☐ Bleach Germicidal Wipes
    - ☐ UV Light Disinfection System
- ☐ Create educational pamphlets for healthcare providers, housekeeping, administration, patients, and families about CDIs

Ensure best patient care

- ☐ Comply with hand hygiene, as described in APSS #2A:
    - ☐ Encourage patient, family, and visitors to practice hand hygiene protocols
    - ☐ Remind all healthcare staff to practice hand hygiene protocols
- ☐ Use soap and water for hand washing
- ☐ Use C. difficile sporicidal agents to clean and disinfect equipment and environment, including equipment that comes into contact with the patient, such as:
    - ☐ Blood pressure cuffs
    - ☐ Pulse oximeters
    - ☐ Other equipment that is not frequently cleaned between patients

Engage staff and use data to find areas for improvement

- ☐ Encourage continuous process improvement through the implementation of quality process measures and metrics
- ☐ Complete a full root cause analysis (RCA) when CDIs are identified by the unit where the infection occurred using a multidisciplinary approach
- ☐ Implement and share all learnings from the RCA
- ☐ Utilize patient stories - written and in video - to help teach and inspire change in the healthcare staff and custodial personnel

What we know about CDIs

Clostridioides difficile infections

Clostridioides difficile (also known asC. diff) is an opportunistic bacterium that can causes symptoms ranging from diarrhea to life-threatening inflammation of the colon.

- C. diff is a spore-forming, Gram-positive anaerobic bacillus that produces two exotoxins: toxin A and toxin B (CDC, 2012)
- It can cause C. difficile-associated diarrhea (CAD), and it accounts for 15-25% of all episodes of CAD
- CDIs can cause many diseases, including:
  - o   Pseudomembranous colitis
  - o   Toxic megacolon
  - o   Perforations of the colon
  - o   Sepsis and, sometimes, death

CDI symptoms include:

- Watery diarrhea
- Fever
- Loss of appetite
- Nausea
- Abdominal pain and tenderness

Some patients have a higher riskof contracting CDIs, including those:

- With antibiotic exposure
- With gastric acid suppressors (e.g., proton pump inhibitors and/or histamine 2 receptor antagonists)
- With immunocompromised status
- Who've had gastrointestinal surgery
- Who spend more time in healthcare settings
- Who may have a serious underlying illness
- Who are elderly (65 years and older)

How is CDI spread?

C. diff is spread among patients through the fecal-oral route. Patients can become infected if they touch items or surfaces that are contaminated with feces and then touch their mouths or other mucous membranes.

In healthcare settings, *C. diff* spores are primarily spread to patients by the hands of healthcare staff who have touched a contaminated surface or item. These spores are not killed by alcohol-based hand sanitizers (Oughton *et al*., 2009; Jabbar *et al*., 2010; Gerding *et al*., 2008).

Preventing CDI

The World Health Organization (WHO) recommends that healthcare staff wash their hands with soap and water before and after patient contact (WHO, 2011).

- In about 20% of patients, CDIs go away within 2-3 days of discontinuing the antibiotic to which the patient was previously exposed to
- The infection can be treated with an appropriate course of antibiotics
- After treatment, research suggests that repeating C. diff testing is not recommended if the patients' symptoms have gone away because they may remain colonized with the bacterium

Leadership plan

Addressing this safety issue will require hospitals and healthcare systems to commit to action in the form of specific leadership, clinical, and technology plans. Hospital governance, senior administrative leadership, clinical leadership, and infection control leadership need to work collaboratively to reduce CDIs.

To achieve a goal of zero preventable deaths, leaders need to commit to taking these key actions.

Leadership in your organization should be familiar with the differences between C. diff colonization and infection:

- Clostridioides difficile colonization:
    o Patient doesn't show clinical symptoms
    o Patient tests positive for C. diff organism and/or its toxin o More common than CDI
- Clostridioides difficile infection:
    o Patient shows clinical symptoms

Show leadership's commitment to reducing CDI
- Commitment and action are required at all levels for successful process improvement
- Hospital governance and senior administrative leadership must champion efforts in raising awareness to prevent and manage CDIs effectively

Create the infrastructure needed to make changes
- Support the design and implementation of an antimicrobial stewardship program
- Integrate surveillance and metrics to ensure prevention measures are being followed by all staff
- Utilize patient stories - written & in video - to identify gaps and inspire change in the healthcare staff and custodial personnel

Action plan

Create, establish, and consistently implement CDI prevention guidelines that focus on educating:

- Healthcare providers and custodial personnel
- Patients and their families

On the following topics:

- Surveillance
- Hand hygiene
- Contact and isolation precautions

Prevention guidelines must also include the establishment of an antimicrobial stewardship program (CDC, 2012; WHO, 2011).

The Association for Professionals in Infection Control and Epidemiology created an evidence-based approach–Guide to Preventing *Clostridioides difficile* Infections. The guide can be accessed online (Carrico, 2013).

CDI prevention can be achieved by acting in the following areas:

Diagnosing a clostridium difficile infection

Doctors use laboratory tests to diagnose CDIs, including:

- Stool cultures
- Molecular tests
- Antigen detection for C. diff
- Toxin testing:
- Tissue culture cytotoxicity assay
- Enzyme immunoassay

The toxin is very unstable and degrades at room temperature, and may be undetectable within 2 hours after collection of a stool specimen. False-negative results can happen when specimens are not quickly tested or kept refrigerated until testing can be done.

Track and analyze your progress
- Implement surveillance
    - o Implement a facility-wide CDI surveillance method of both process measures and the infection rates to which the processes are linked

Use safe, clean equipment
- Practice standardized hand hygiene (Oughton, 2009; WHO, 2011)
    - o Healthcare providers must wash hands with soap and water before putting on and after removing gloves when caring for patients with a CDI
    - o No agent, including alcohol-based hand sanitizers, is effective against *C. diff* spores
    - o Appropriate use and removal of gloves is essential when caring for patients with diarrhea illnesses
- Take contact and isolation precautions
    - o Use Standard Precautions for all patients, regardless of diagnosis
    - o Place patients with CDI on Contact Precautions in private rooms when available
    - o Perform hand hygiene and put on gown and gloves before entry to the patient's room
    - o Use dedicated equipment, such as a blood pressure cuff, thermometer, and stethoscope
    - o Remove gown and gloves and perform hand hygiene before exiting the room
    - o Educate the patient and family about precautions and why they are necessary and ensure that visitors are properly attired in personal protective equipment

Provide staff training
- Be aware of environmental infection prevention
    - o Ensure that staff responsible for environmental cleaning and disinfection have been appropriately trained

- o Use EPA-approved germicide for routine disinfection during non-outbreak situations (USEPA, 2018)Ensure that staff allow appropriate germicide contact time
- o For routine daily cleaning of all patient rooms, address:
  - Bed, including bedrails and all patient room furniture
  - Bedside commodes and bathrooms, including the sink, floor, tub/shower, and toilet
  - High-touch surfaces like call buttons and the TV remote
  - All communication devices such as walkie-talkies used by nurses to communicate with the nursing station and staff personal cell phones

Report outcomes inside your organization

- Antimicrobial stewardship and CDI
  - o Implement a program that supports the thoughtful use of antimicrobial agents (CDC, 2016)
  - o Ensure that the program incorporates:
    - A process that monitors and evaluates antimicrobial use
    - Provides feedback to medical staff and leadership
- Work with the healthcare institution's Infection Control program to reduce the risks of transmission

Technology plan

These suggested practices and technologies have shown proven benefit or, in some cases, are the only known technologies for certain tasks. If you know of other options not listed here, please complete the form for the PSMF Technology Vetting Workgroup to consider: https://patientsafetymovement.org/actionable-solutions/apss-workgroups/technology-vetting/

Consider implementing the following technologies to address CDIs in your organization:

System or Practice	Available Technology
ONC Meaningful Use Certified EHR system Electronic Health Record (EHR) System with the following capabilities: • Computerized Provider Order Entry (CPOE) • Drug-drug interaction check • Drug-allergy interaction check • Clinical Decision Support tools (CDS) • High alerts for CDI	
Support proper surface cleaning and utilize as part of a defined environmental control best practice program	

Support proper hand hygiene and utilize as part of a defined hand hygiene best practice program including:	• See APSS #2A for a list of hand hygiene technology suppliers
• product utilization and staff movement tracking • sensor bracelets • alcohol sensing technologies	

Measuring outcomes

Topic

Healthcare-associated Clostridioides Difficile Infection (CDI) Rate

Rate of patients with a healthcare associated CDI per 1,000 patient days

Outcome measure formula

Numerator: Number of healthcare associated CDI based on CDC National Healthcare Safety Network (NHSN) definitions

Denominator: Total number of patient days based on CDC NHSN definitions

* Rate is typically displayed as Infections/1000 Patient Days

Metric recommendations

Direct Impact:

All hospitalized patients

Lives Spared Harm:

Lives Spared Harm = (CDI Rate $_{baseline}$ - CDI Rate $_{measurement}$) X Patient Days $_{baseline}$

Lives Saved:

Lives Saved = Spared Harm X Mortality Rate

Notes:

To meet the NHSN definitions, infections must be validated using the hospital acquired infection (HAI) standards (CDC, 2016). Infection rates can be stratified by unit types further defined by CDC. Infections that were present on admission (POA) are not considered HAIs and not counted.

Data collection

C. diff and patient days can be collected through surveillance (at least once per month) or gathered through electronic documentation. Infections must be monitored according to NHSN surveillance definitions. Denominators documented electronically must match manual counts (+/- 5%) for a 3 month validation period.

Settings

Infection Surveillance will occur in any inpatient location where denominator data can be collected, which may include critical/intensive care units, specialty care areas, step- down units,

wards, and chronic care units. Surveillance will NOT be performed in Neonatal Intensive Care Units, Specialty Care Nurseries, babies in Labor, Delivery, Recovery and Postpartum (LDRP) room, or well-baby nurseries. If LDRP locations are being monitored, baby counts must be removed.

Mortality (will be calculated by the Patient Safety Movement Foundation)**:**

The PSMF, when available, will use the mortality rates associated with Hospital Acquired Conditions targeted in the Partnership for Patient's grant funded Hospital Engagement Networks (HEN). The program targeted 10 hospital acquired conditions to reduce medical harm and costs of care. "At the outset of the Partnership for Patients (PfP) initiative, the Department of Human Health Services agencies contributed their expertise to developing a measurement strategy by which to track national progress in patient safety—both in general and specifically related to the preventable Hospital-acquired Conditions (HACs) being addressed by the PfP. In conjunction with CMS's overall leadership of the PfP, AHRQ has helped coordinate development and use of the national measurement strategy. The results using this national measurement strategy have been referred to as the "AHRQ National Scorecard," which provides summary data on the national HAC rate (AHRQ, 2019). CDI was included in this work, under the "All Other HACs" definition, with published metric specifications. This is the most current and comprehensive study to date. *Based on these data the estimated additional inpatient mortality for CDI is 0.045 (45 per 1000 events).*

Conflicts of interest disclosure

The Patient Safety Movement Foundation partners with many stakeholders to focus on how to address patient safety challenges. The recommendations in the APSS are developed by workgroups that include patient safety experts, clinicians, healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers. Some of the APSSs recommend technologies that are offered by companies involved in the Patient Safety Movement Foundation. The workgroups have concluded, based on available evidence, that these technologies work to address APSS patient safety issues. Workgroup members are required to disclose any potential conflicts of interest.

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References

Agency for Healthcare Research and Quality (2019). AHRQ national scorecard onhospital-acquired conditions. Retrieved from: https://www.ahrq.gov/hai/pfp/index.html

Carrico. (2013). Guide to Preventing Clostridium difficile Infections. Retrieved from https://apic.org/wp-content/uploads/2019/07/2013CDiffFinal.pdf.

Centers for Disease Control and Prevention. (2016). Clostridium difficile Infection (CDI) Prevention Primer [Powerpoint Slides]. Retrieved from https://www.cdc.gov/hai/ppt/CDI-Primer-2-2016.pptx

Centers for Disease Control and Prevention. (2018, January). Identifying Healthcare-associated Infections (HAI) for NHSN Surveillance. Retrieved from https://www.cdc.gov/nhsn/pdfs/psc-manual/2psc_identifyinghais_nhsncurrent.pdf

Centers for Disease Control and Prevention. (2012, October). Instructions for Mapping Patient Care Locations in NHSN. Retrieved from https://www.cdc.gov/nhsn/pdfs/psc/mappingpatientcarelocations.pdf

Centers for Disease Control and Prevention. (2018, January). Multidrug-Resistant Organism & Clostridium difficile Infection (MDRO/CDI) Module. Retrieved from https://www.cdc.gov/nhsn/PDFs/pscManual/12pscMDRO_CDADcurrent.pdf

Centers for Disease Control and Prevention. (2012). Vital Signs: Preventing Clostridium difficile Infections. *MMWR. Morbidity and Mortality Weekly Report, 61*(9), 157. Retrieved from http://www.cdc.gov/mmwr/pdf/wk/mm6109.pdf

Gerding, D. N., Muto, C. A. and Owens, R. C. J. (2008). Measures to Control and Prevent Clostridium difficile Infection.. *Clin Infect Dis, 46 Suppl 1*, S43–9. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/18177221

Healthcare Cost and Utilization Project. (2016). Clostridium Difficile Hospitalizations. Retrieved from https://www.hcup-us.ahrq.gov/reports/HCUPCDiffHosp2010-2014Report102616.pdf

Jabbar, U., Leischner, J., Kasper, D., Gerber, R., Sambol, S. P., Parada, J. P., … Gerding, D. N. (2010).

Hands. Infection Control & Hospital Epidemiology, 31(06), 565-570. Doi: 10.1086/652772. Leonard, Westinghouse, & Bradman. (2013). Green Cleaning, Sanitizing, and Disinfecting: A Curriculum for Early Care and Education. Retrieved from https://www.epa.gov/sites/production/files/documents/ece_curriculumfinal.pdf.

Effectiveness of Alcohol-Based Hand Rubs for Removal of Clostridium difficile Spores from Hands. *Infection Control & Hospital Epidemiology, 31*(06), 565–570. doi:10.1086/652772

National Scorecard on Rates of Hospital-Acquired Conditions 2010 to 2015: Interim Data From National Efforts To Make Health Care Safer. (2016, December 09). Retrieved from https://www.ahrq.gov/professionals/quality-patient-safety/pfp/2015-interim.html

Oughton, M. T., Loo, V. G., Dendukuri, N., Fenn, S. and Libman, M. D. (2009). Hand Hygiene with Soap and Water Is Superior to Alcohol Rub and Antiseptic Wipes for Removal of Clostridium difficile. *Infection Control & Hospital Epidemiology, 30*(10), 939–944. doi:10.1086/605322

United States Environmental Protection Agency. (2018). LIST K: EPA's Registered Antimicrobial Products Effective Against Clostridium difficile Spores. Retrieved from https://www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium

World Health Organization. (2011, June 08). System Change - Changing Hand Hygiene Behaviour at the Point of Care. Retrieved from http://www.who.int/gpsc/tools/faqs/system_change/en/